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I, LEANNE MYNOTT, TEAM LEADER EXAMINATION SUPPORT AND SALES hereby certify that annexed is a true copy of the Provisional specification in connection with Application No. PQ 3334 for a patent by MALCOLM BARRY JAMES filed on 11 October 1999.

WITNESS my hand this
Twenty-third day of October 2000



LEANNE MYNOTT
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ORIGINAL

**PROVISIONAL SPECIFICATION FOR AN INVENTION
ENTITLED**

Invention Title: **DIE IMPROVEMENTS**

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The invention is described in the following statement :

In a previous Provisional Patent Application filed in Australia and entitled IMPROVEMENTS RELATING TO COOLING OF DIES, I have disclosed an arrangement which assists in controlling the temperature of the die.

- The arrangement includes at least one closed chamber in which there is a
- 5 liquid and only the vapour of the liquid in a space above the liquid within the chamber and there are means to effect a cooling of any such vapour that might be formed at one place within the chamber and transfer or be transferred to another place where such cooling effecting condensation can take place.
- In a further development, I have discovered that there is value in having the
- 10 liquid within the chamber being kept at different heights. This has some advantages where for instance the liquid is kept in separate pools which can be individually designed to match a particular location for its heat dissipation requirements and the like. Such different "pools" or "reservoirs" can be at different heights within the chamber but because the head of water within any
- 15 specific pool is similar, then boiling temperature gradients through the depth of the liquid in a pool will also remain similar.
- Further, there can be replenishment to maintain a level of liquid in any pool by mechanisms such as allowing any overflow from one to cascade to another and so on.
- 20 In another way, if a foaming agent is added to the liquid, then upon boiling, the liquid is chosen so as to foam and the liquid will then rise being lifted by this foaming action again to different heights within the chamber by reason of this quite different action, the film or bubbles of foam being expanded and caused to extend through to various parts of the chamber.
- 25 In this way then, the liquid itself is distributed through the walls of the chamber and implicitly then is under a different head of liquid than the liquid in any collected reservoir, insofar that liquid adhering to the surfaces is under very different "heads" of liquid or in another way is at "different heights".
- In a further development, there has now been applied, a surface material to
- 30 the inner wall of the chamber which will assist in retention of liquid in close vicinity to the wall.

In one example, at least some parts of the inner surface of the chamber are coated with a material so that surface tension implicit between the liquid and the material will assist in continuing retention of the liquid against the wall.

- In one example, flock in the form of a number of short strands of fibre are
- 5 attached end on in close vicinity one to the other, to the surface so that liquid which reaches any such selected area thus treated, will be held to be of greater depth and therefore act as a greater reserve. This then allows for a greater tolerance in a refresh rate of liquid needed to keep the surface wet. In other words, the amount of liquid available will be greater than with a smooth
- 10 surface and allow therefore more tolerance in any replacement of liquid that might be being used.

- The replenishment of liquid mechanism can be variously a flow from vapour being condensed above the selected area and therefore seeping or pouring over the area, it can be caused by splattering or spraying from devices within
- 15 the chamber, it can be subject to replenishment by rising foam, or it can be subject to replenishment simply by ebullient action of the liquid during any boiling action.

- The invention then could be said to reside in a mold for molding of plastics material where there is a closed chamber using the heat transfer system
- 20 described to effect a transfer of heat, characterised in that at least some of the surface of the chamber has attached thereto further material or materials to assist in retention of the liquid in the adjacent vicinity of a target surface of the wall of the chamber.

- In preference, the liquid is water.
- 25 In preference the foaming agent is a foaming causing surfactant.
- In preference, the materials added are a flock which is adhered by an appropriate adhesion process so that the respective particles of flock are secured end on to the surface of the chamber.
- 30 In preference, the thus treated surface is replenished with water from time to time during an operation of the die by liquid being supplied from above.

In another example, replenishment is effected by foam causing film of the liquid to pass across the selected surface area wetting this thereby.

- In another form of this invention this can be said to reside in the method of effecting heat transfer within a closed chamber for the purposes described
- 5 where the method includes having within the closed chamber only liquid, and the vapour of liquid within a space above the liquid within the chamber, and where a surface of the chamber selected for purpose of extracting heat therefrom is above a level of the liquid within the chamber and effecting replenishment of liquid in respect of that selected area from time to time where
- 10 the selected area include a treatment to effect retention of the liquid by use of surface tension of the liquid.

- Temperatures of a die depend to some extent upon the thickness of the metal between the heat source(eg a moulding surface) and the selected area within the closed chamber. If there is a greater thickness, then there will be a
- 15 temperature gradient that depends on the various characteristics of the metal of the die and the respective temperatures at each side. This can be taken advantage of in allowing some parts of a moulding surface to be at a different temperature than others.

- Throughout this specification the purpose has been to illustrate this invention
- 20 and not to limit this.

Dated this 11th day of October 1999

MALCOLM BARRY JAMES
By his Patent Attorneys,
COLLISON & CO.

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